

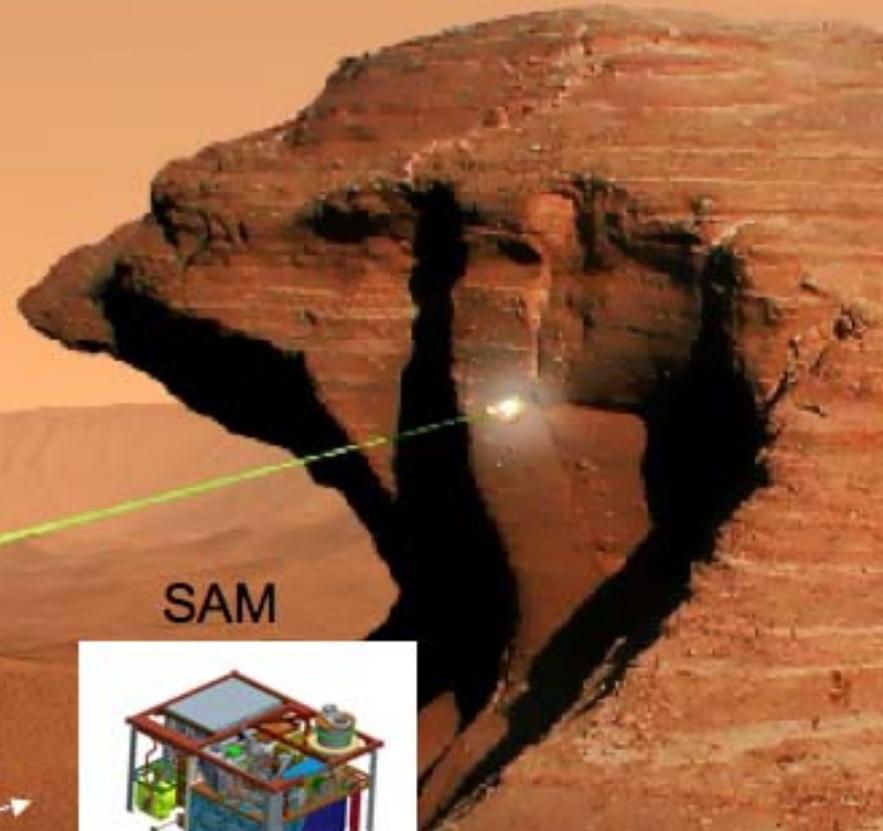
Molecular Signatures of Life in Surface Ice and Snow as a Mars Analog

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Learning how to detect carbon, habitat, and life on Earth as we might on Mars

Goals of the project:

- Determine the effectiveness of pyrolysis (SAM and Phoenix) vs. conventional method
- Find molecular signatures of life

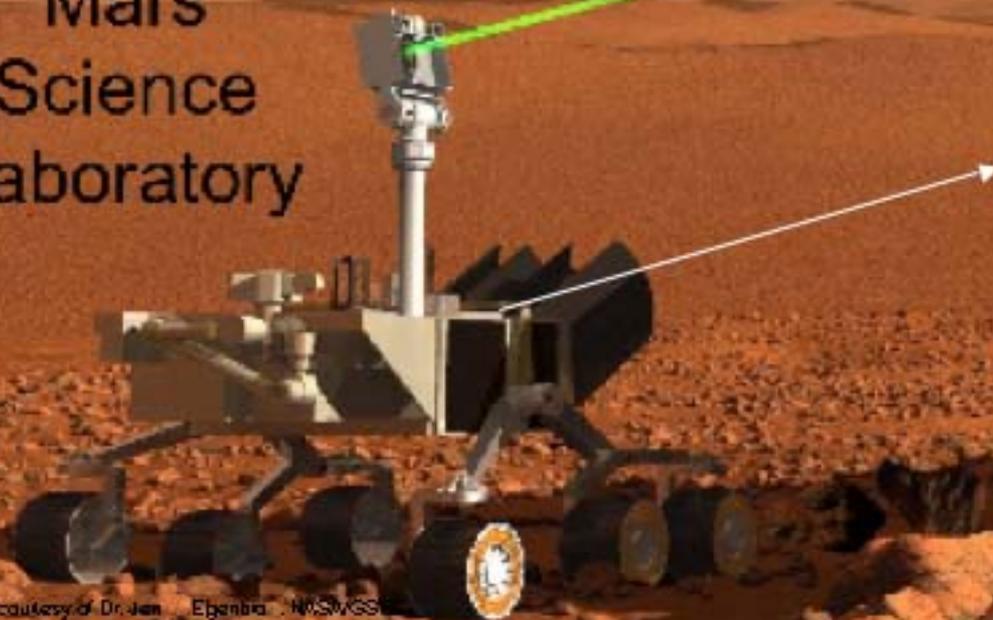


SAM

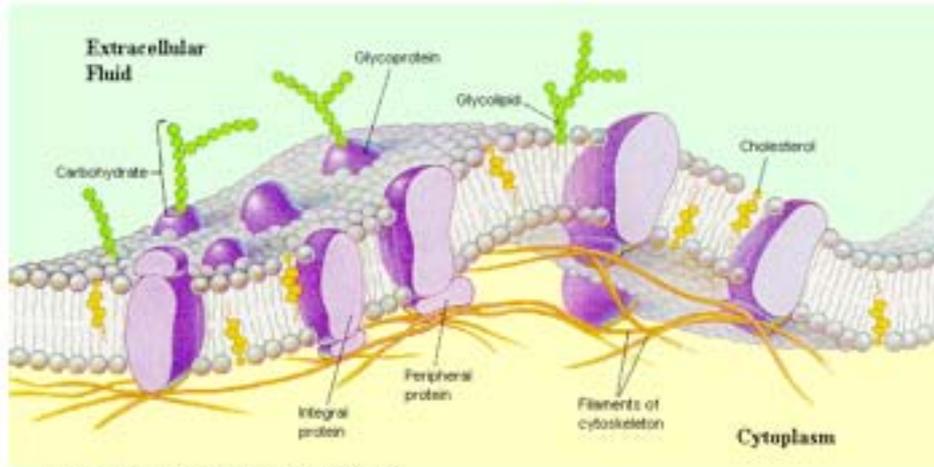


<https://www.nasa.gov/feature/d460115main010114>

Mars
Science
Laboratory

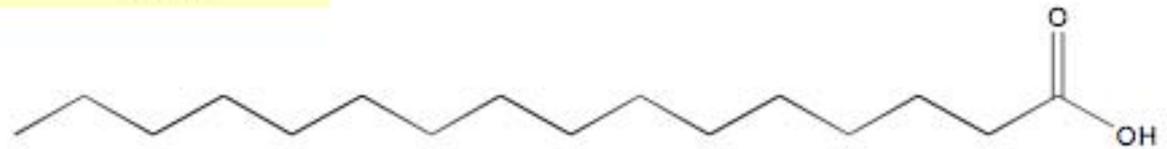


Lipids as Molecular Signatures of Life



<http://www.clbhe.com/br/ugusthokoladto.sacno.vcljy>

<http://www.khanacademy.org/a/animal-cell-structure/a/animal-cell-structure>



hexadecanoic acid



octadecanoic acid

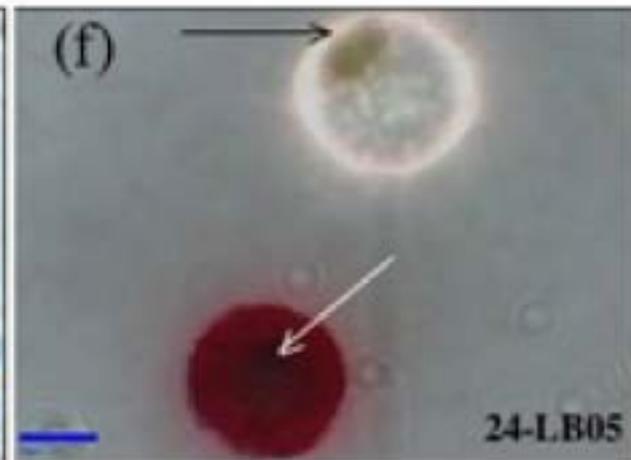
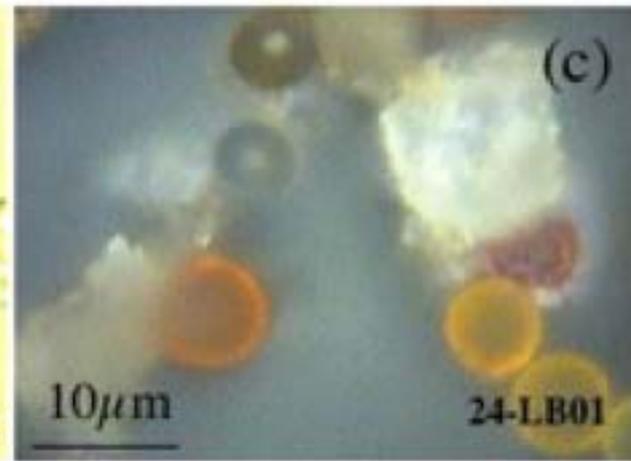
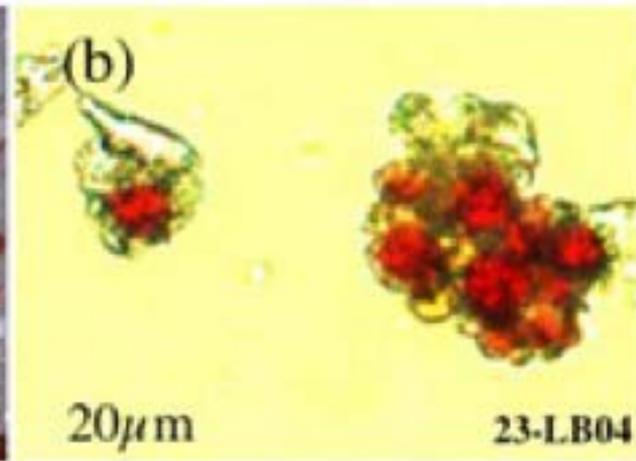
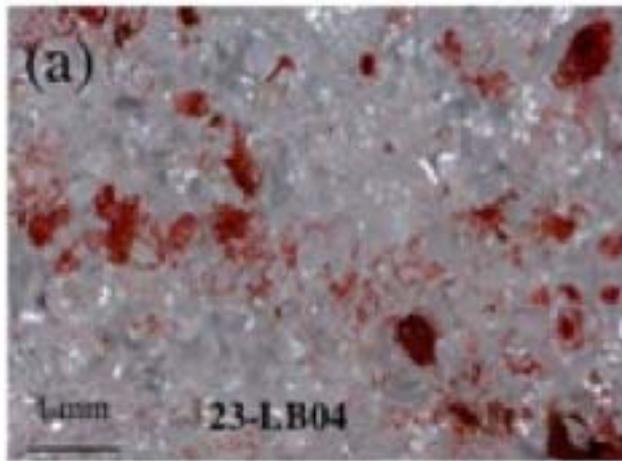


linoleic acid

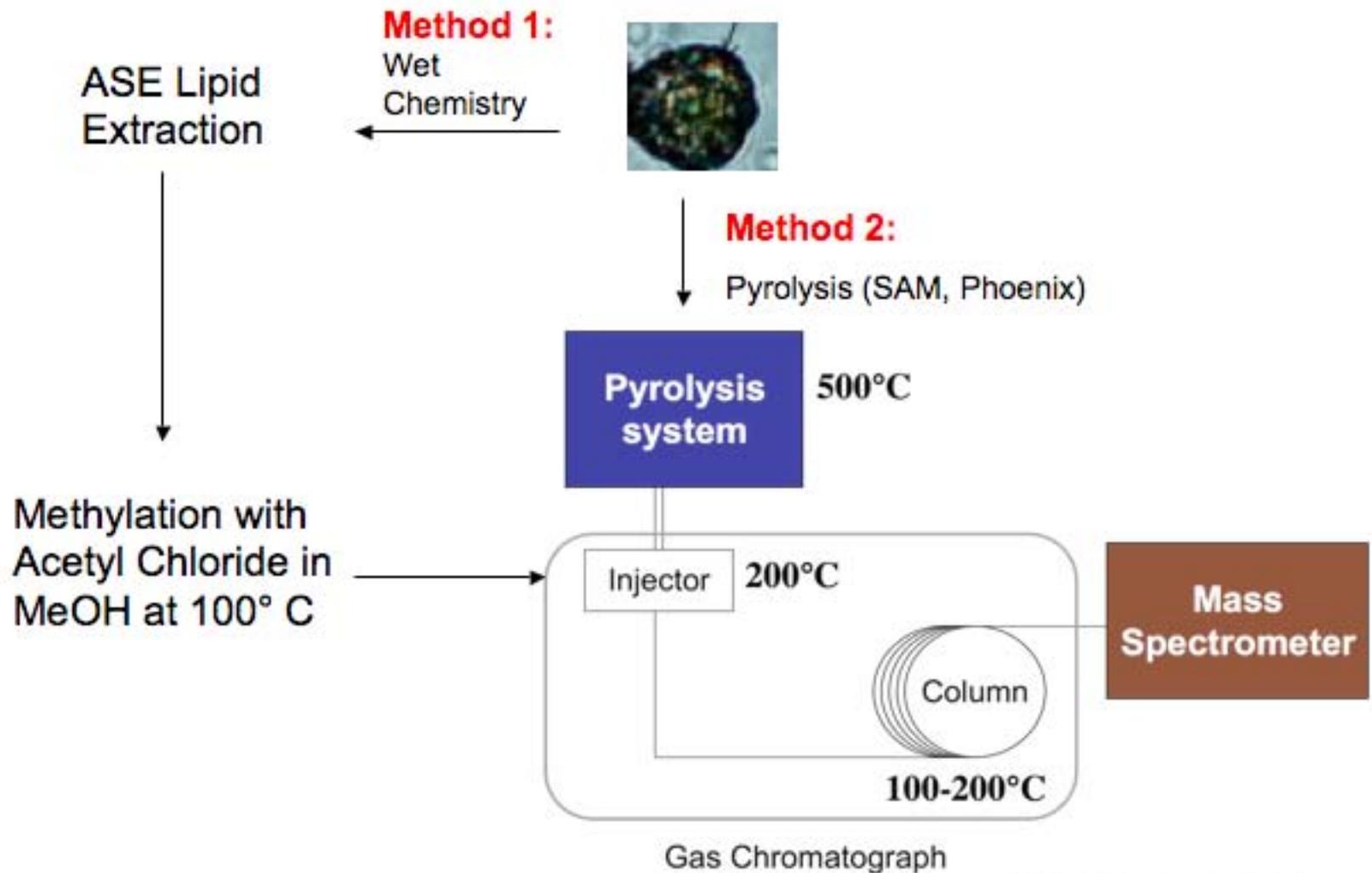
Snow Algae site on Friedrichsbreen, Svalbard 2007



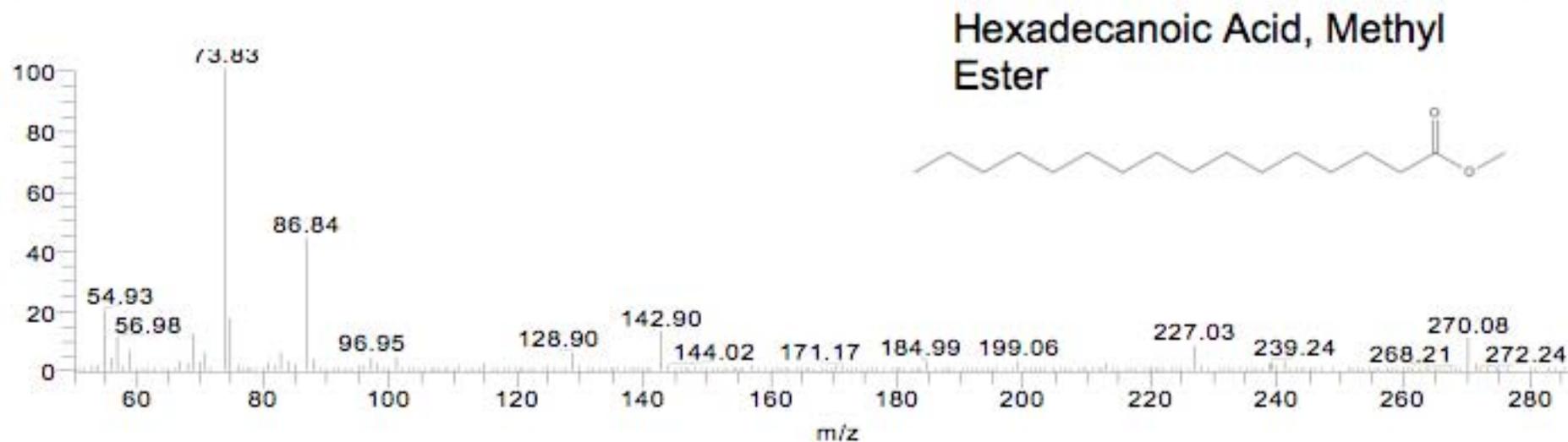
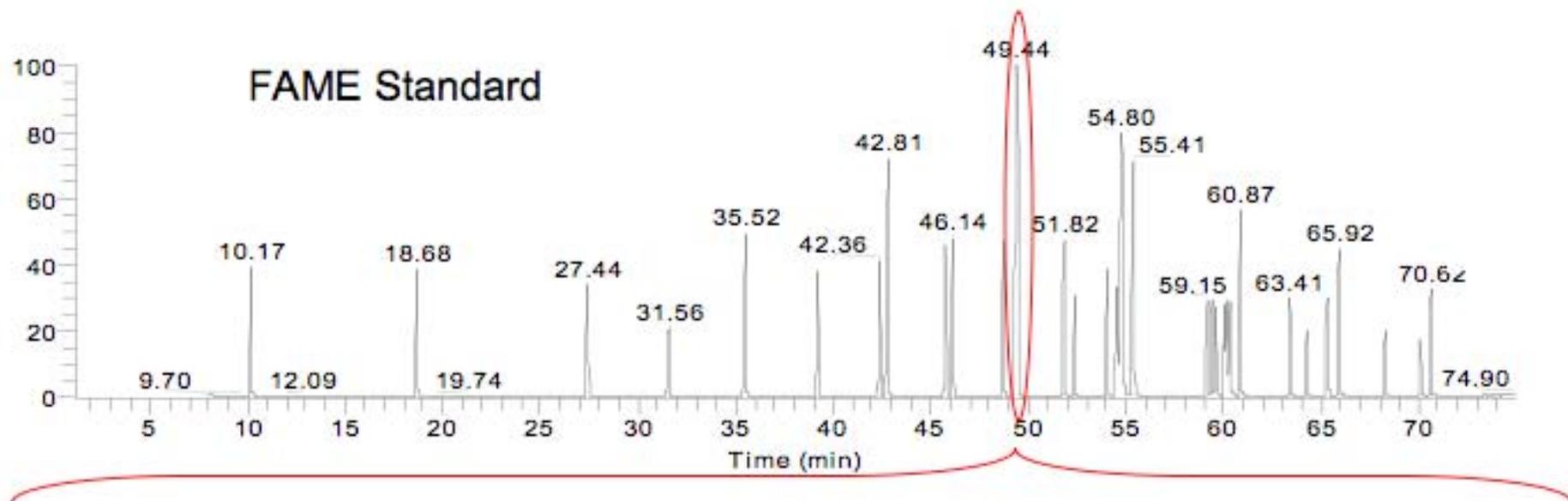
Snow Algae



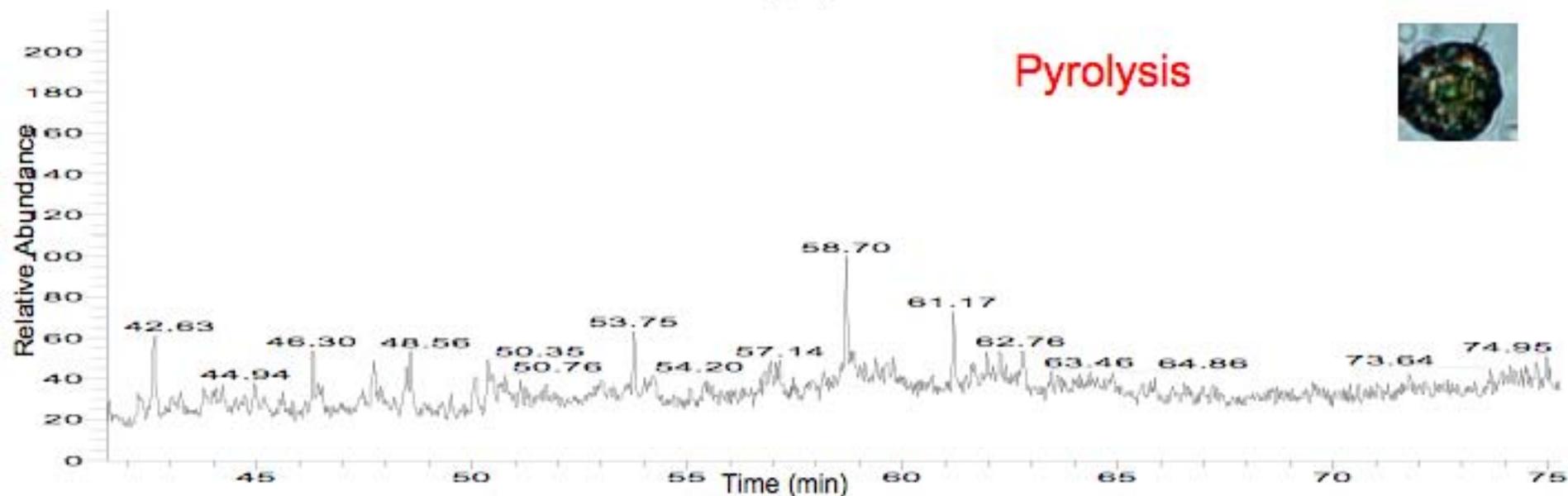
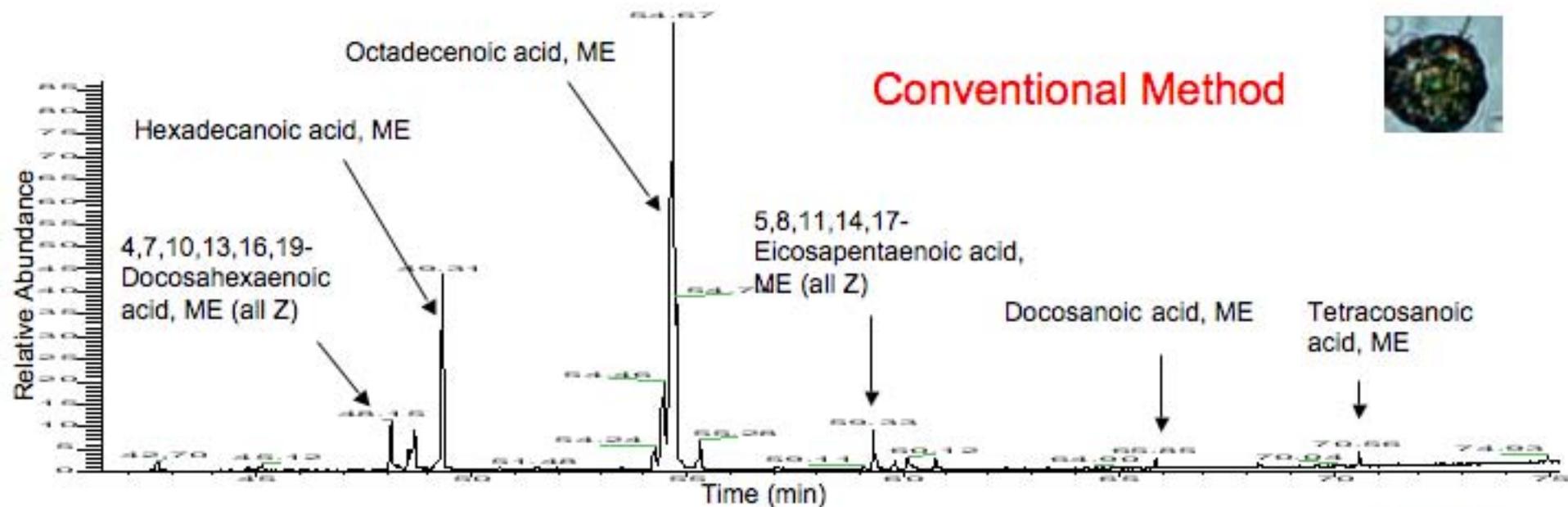
Gas Chromatography-Mass Spectroscopy



GC/MS FAME Standard

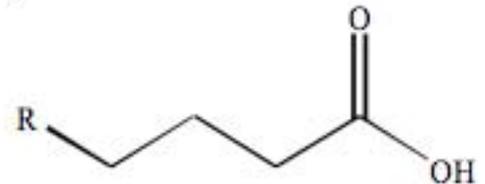


GC Data of Green Snow Algae

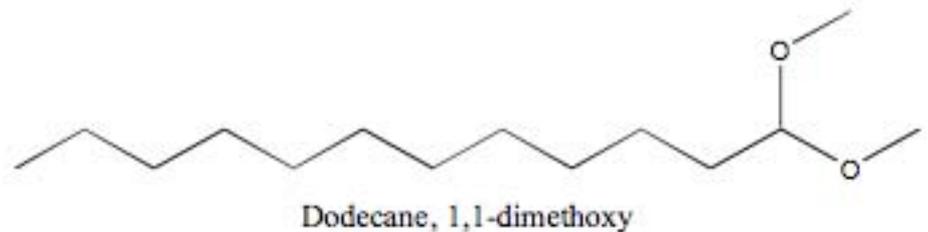


Results

- Fatty acids found in all snow algae samples:
 - 4,7,10,13,16,19-Docosahexaenoic Acid, ME (all Z)
 - Hexadecanoic acid, ME
 - 9,12-Octadecadienoic acid (Z,Z), ME
 - 9,12,15-Octadecatrienoic acid, ME (all Z)
 - Octadecanoic acid, ME
 - 5,8,11,14,17-Eicosapentaenoic acid, ME (all Z)
 - Eicosanoic acid, ME
 - Docosanoic acid, ME
 - Tricosanoic acid, ME
 - Tetracosanoic acid, ME
 - Hexacosanoic acid, ME



- Interesting:
 - Dodecane, 1,1-dimethoxy



Conclusions

- Wet chemistry/conventional methods provide much cleaner and clearer results than pyrolysis
- The results show that there are several fatty acids that could potentially serve as molecular biomarkers for life identification
- Characteristics of the found molecular signatures of life include:
 - Even-chained fatty acids
 - Unsaturation

Acknowledgments



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